

Abstract of the Disclosure

A laser-assisted, direct metal deposition (DMD<sup>tm</sup>), preferably in a closed-loop arrangement, is used to fabricate designed articles and tools such as molds and tools with improved properties. According to the method of the invention, a substrate is provided  
5 having a surface, onto which a layer of a material is deposited having the desired characteristic using the laser-assisted DMD process. In different embodiments, the substrate/layer combination may be tailored for improved wear resistance, thermal conductivity, density/hardness, corrosion and/or resistance to corrosion, oxidation or other undesirable effects. Alternatively, the layer of material may be tailored to have a  
10 phase which is different from that of the substrate. In particular, the layer material itself may be chosen to promote a phase which is different from that of the substrate. In the preferred embodiment, a closed-loop, laser-assisted DMD process is deployed to build the substrate on an incremental basis. To enhance throughput, the substrate and/or outer layer(s) of material may be fabricated using a robotic closed-loop DMD arrangement. In  
15 concert with the improvements made possible through the tailored outer layer(s), the method may further include the step of incorporating one or more conformal cooling channels within the component or the formation of one or more conductive heat sinks or thermal barriers during the DMD fabrication of the component itself.